DOCUMENT RESUME

ED 069 062 EC 050 137

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|---|---|
| TITLE | Communication and Computation Skills for Blind Students Attending Public Schools. |
| INSTITUTION | Suffolk County Board of Cooperative Educational Services, Dix Hills, N.Y. |
| PUB DATE | 72 |
| NOTE | 38p. |
| EDRS PRICE | MF-$0.65 HC-$3.29 |
| DESCRIPTORS | *Braille; *Communication Skills; *Exceptional Child Education; Itinerant Teachers; Mathematics; Public Schools; Reading; Reading Readiness; *Teaching Methods; *Visually Handicapped; Writing Skills |
| IDENTIFIERS | Nemeth Code |

ABSTRACT

Outlined are evaluative and instructional procedures used by itinerant teachers of blind children in public schools to teach readiness for braille reading and writing, as well as braille reading and writing, signature writing, and the Nemeth Code of braille mathematics and scientific notation. Readiness for braille reading and writing is considered in terms of attitudinal readiness, physical evaluation, social and emotional readiness, and the development of tactile discrimination and prewriting skills. Noted are aims and techniques of teaching braille, mechanics of reading braille for different age groups from kindergarten through senior high school, and problems inherent in the use of braille such as difficulties with unwieldy or hard to obtain volumes and confusion due to the multiple uses of braille symbols. Examined are techniques for teaching braille writing, the use of the slate and stylus for braille writing, and the mechanics of signature writing. Listed are supplementary aids for teaching the Nemeth Code to kindergarteners through senior high school students as well as aids and devices for supplementary mathematics and science. (GW)

ED 069042

BOARD OF COOPERATIVE EDUCATIONAL SERVICES
Third Supervisory District of Suffolk County

# Visually Impaired Program

# COMMUNICATION and COMPUTATION SKILLS for Blind Students Attending Public Schools

EC 050 137E

1972

ED 069062

# COMMUNICATION AND COMPUTATION SKILLS FOR BLIND STUDENTS ATTENDING PUBLIC SCHOOLS

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# INTRODUCTION

This outline is an attempt to present a description of some of the services given by the teachers of the visually impaired to the blind children enrolled in regular classes of the eighteen school districts encompassed by BOCES, Third Supervisory District of Suffolk County.

All of us are certified teachers who have further specialized in Education for the Blind and Visually Handicapped. Our methodology has been derived not only from special methods courses taken at various universities, especially Hunter College and Michigan State University, but also from the generous sharing by BOCES personnel, past and present, of the wealth of their own insights and experience.

Additional thanks are given to the Industrial Home for the Blind Nassau-Suffolk Braille Library, which provides free to the children most of the braille text books and many of the supplementary aids they use through elementary and secondary grades. We also wish to thank those flexible and cooperative classroom teachers at all grade levels who have sought so hard to include the blind children in all classroom activities.

Since, as itinerant teachers, we provide individualized instruction to visually handicapped children, it follows logically that our teaching is prescriptive - problems must be diagnosed, appropriate solutions sought, and special methods and materials used judiciously. The differences in speed of maturation and levels of ability among blind children are made even more noticeable than

those among their sighted counterparts by their lack of that primary sense, vision, through which it has been estimated that 90% of learning normally takes place.

Although our ingenuity is often taxed and our creativity frequently challenged, we still maintain that there is always a solution to any learning problem. When a standard method fails, one means after another is tried; materials can be devised, invented or modified until success is reached.

The usual first reaction to hearing that we teach blind children is, "That must require an awful lot of patience." And it does. But this is invariably followed by the comment, "It must be very rewarding." And <u>that</u> it certainly is.

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1. Reading helps fill their many leisure hours; prevents day-dreaming.
2. Using time reading develops habits of busyness rather than indolence.
3. Visual word descriptions help fill informational void caused by blindness.

B. Mental maturation

1. Establish mental age through use of verbal scales administered by district psychologists or by referral to agencies for the blind for evaluation.
2. Determine equivalent grade expectancies for mental age.
3. Observe and develop degree of alertness to new situations.
4. Enhance curiosity regarding environment.
5. Develop conversational and reasoning skills; use of deductive and inductive logic.
6. Gradually prolong attention span.

II. Physical Evaluation

A. Analyze ophthalmological reports to determine whether braille or large type is advisable.

B. If particular eye disorder has an unstable prognosis, maintain contact with ophthalmologist as well as child's parents.

C. Have any usable vision evaluated; assure the acquisition of any helpful optical lenses or magnifying devices.

D. Help child use and care for these aids properly; encourage him to make best maximum use of his usable vision.

E. Have audiometer screening done to detect hearing loss.

1. Slight loss is hard to discover in classroom.
2. Loss will hinder ability to learn reading because of lack of clear auditory pattern of word sounds; learning braille reading depends greatly on use of phonics.
3. Low frequency loss causes difficulty with vowel sounds; high frequency loss with consonants.
4. Secure hearing aids if loss is correctable.

III. Development of Social and Emotional Readiness - correction of weak areas through building confidence and enhancing self-image. 

A. Symptoms of immaturity

1. Poor ability to concentrate
2. Resistance to authority
3. Infantile behavior
4. Feelings of inadequacy
5. Withdrawal or agressive tendencies

B. Causes of slow progress

1. Lack of preparation for new school situation.
2. Shortage of support from home.
3. Failure to have built a sense of responsibility.
4. Emotional conflicts
5. Overanxiety on part of parent or classroom teacher
6. Too competitive a spirit in classroom.

C. Supportive measures to be taken

1. Encourage child to discuss his feelings and fears; show understanding.
2. Enrich experiences to build stronger concepts.
3. Help child to accept constructive criticism as an aid.
4. Foster normal play with sighted children.
5. Point out and discuss appropriate vs. inappropriate behaviors.
6. Emphasize skill of observation using touch, sound and smell: noticing likenesses or differences, associating objects and words, drawing conclusions and testing their validity.
7. Develop and exaggerate an area in which the blind child can excell; this will often be braille.
8. Consult with parents, classroom teachers, and other school personnel regularly.

IV. Development of Tactile Discrimination

A. Gross motor development, coordination and spatial orientation.

1. Must be developed before the more subtle skills.
2. Use a wide variety of play activities and equipment.

a. Playground apparatus - swings, see-saws, jungle gyms.
b. Gym equipment - rings, trapezes, ladders,
c. Supplementary play materials and games-musical chairs, jump ropes, large balls with audio signal for ease in locating, giant blocks.

3. Supervise and guide the exploration and safe use of equipment
4. Plan and undertake exploration of child's environment, with complete verbal descriptions and tactile investigations.

   a. Investigate all areas of school building that can be seen by sighted children: classrooms, storage closets, insides of glass covered showcases, janitor supply closets, heating plants, both sides of cafeteria counter, office machines, nurse's office, lavatories, etc. (Use step counting for size concepts, ladders to get idea of ceiling heights; climb out ground floor windows to show indoor-outdoor space relationships.)
   b. Meet school personnel-administrative, faculty, secretarial and custodial. Encourage child to learn names, recognize voices, carry on conversations.
   c. Tour neighborhood around school-mailboxes, types of plants and trees, cars in parking lots, bicycles in bike racks, stores, buildings in various stages of construction, etc.

5. Form a good body concept.

   a. Left-right, up-down, under-over.
   b. Parts of body, relationships and use. Variations of size and form among people.

B. Hand coordination, development of finer muscles, beginning of tactile discrimination with finest muscles and nerves.

   1. Materials and techniques

      a. Texture discs for pairing
      b. Bags of small identifiable ogjects. (Develop scale model concepts here, to prepare for two-dimensional diagrams used later.)
      c. Finger-play games.
      d. Bead stringing and geometric puzzles.
      e. Pyramid stacking cones, number concept boards.
      f. Self-care skills-snapping, buttoning, tying, zipping.

   a. Stress neatness of materials and concentration on their placement to prevent later loss of time in searching.

C. Development of tactile discrimination in fingertips.

   1. Attempt to develop sensitivity in ring and middle

fingers as well as index fingers.

2. Desirability of ambidexterity for braille reading skills.
3. Training in direction-following

   a. Remembering items in sequence
   b. Translating verbalized directions into action
   c. Completion of activity

4. Fingertip discrimination, becoming gradually more subtle

   a. Texture differences with slightly varying substances
   b. Large braille cell model for dot concept
   c. Large braille samples
   d. Introduction of some braille letter symbols and their use as initial consonants.
   e. Practice in an evenly flowing left to right hand motion while reading; avoidance of letter - rubbing or up-and-down motion while reading; practice in keeping place, staying on line, and locating next line.
   f. Practice with actual sized braille to discover likenesses and differences, using whole - letter approach.
   g. Alphabet books - small items labelled with initial letter and brailled name.
   h. Alertness for too great pressure; can cause tension and nervousness.

      1. Results in loss of perception of stimuli
      2. Causes decrease in muscle movement activity
      3. Ultimately results in exhaustion

IV. Simultaneous Development of Pre-Writing Skills

   A. Importance of correct posture.

      1. Adjust seat height - feet flat on floor
      2. Two-finger space between knees and desk

   B. Finger strengthening through nursery rhyme games, finger puppets, piano keys, exercises.

   C. Develop concept of words being composed of letters, or contractions, in an ordered left to right sequence.

   D. Introduction of braille writer, parts, uses of each part, stressing importance of care of the machine

   E. Practice writing isolated letters and checking results.

   F. Learn all letters of alphabet and numbers from 1-10

G. Name writing, with contractions.

Section Two: Braille Reading

I. Teaching Reading through Braille

A. Basic Aims

1. To Teach the child to read competently, in order that he can perform the same scholastic activities as his sighted peers.
2. To have him regard braille not as an inferior substitute for the printed word, but as his natural and normal means of written communication.
3. To foster feelings of security and satisfaction with braille.
4. To teach braille not in isolation, but as a component tool of the language arts program.
5. To stress, from the beginning, the proper mechanics of braille reading in order to insure his attainment of the maximum potential speed, accuracy and enjoyment.

B. Supportive Techniques

1. Use the same basal readers as sighted classmates; provide the identical texts used in other subject areas.
2. Give full description of the illustrations prior to reading each story.
3. Help child to infer meaning and to predict the outcome of each story.
4. Link reading material to concrete life experiences.
5. Stimulate development of good speaking vocabulary.
6. Use any supplementary actions, body motions, experiences or materials needed to form a concept not grasped by words alone.

C. Braille Reading Program Materials

1. Should be double spaced through third grade.
2. Braille dots should be neither too high nor too pointy; resulting fingertip irritation causes higher likelihood of error and a dislike of reading.
3. Must accomodate for the slower speed of braille reading; too lengthy lessons cause fatigue and frustration.
4. Should be closely related to the other language arts - speaking, writing and listening.
5. Should utilize a wide variety of reading activities and offer a multitude of materials.
6. Should take advantage of the many magazines being rendered in braille editions by acquiring subscriptions of those which pertain to the child's interests.
7. Should include maps, charts, and graphs of increasing difficulty, as called for by the curriculum.

8. Ought to relate to the child's experiences, yet widen his horizon of knowledge, while sustaining interest at his own comprehension level.
9. Can include experience stories, composed with the child, using simple vocabulary, short sentences and repetition, then brailled, bound, and illustrated with felt cutouts or scale model items.
10. Should have inkprint words written over braille characters so the blind child can share his materials with his classmates.
11. Should include a brailled copy of daily blackboard work for presentation to the child by the classroom teacher at the appropriate time.
12. Ought to make frequent use of flash cards, especially for reading games.

    a. Vocabulary recognition games

        (1) Games classifying objects, animals, birds, etc. into categories.
        (2) Matching games-many variations on "old maid".
        (3) Riddle games-matching riddles and answers.
        (4) Pairing antonyms, homonyms.
        (5) Building compound words, or locating cards with smaller word components.
        (6) Selecting the one of four words on a card that does not belong.
        (7) Selecting the two words of four on a card that rhyme.

    b. Phonetic skill games.

        (1) Words beginning or ending with same consonants.
        (2) Words with similar vowel sounds.
        (3) Silent E games.
        (4) Hide and seek - discovering silent letters.
        (5) Word wheels with interchangeable consonants and blends.

    c. Braille contraction recognition games.

    d. Multipurpose games

        (1) Syllabification game
        (2) Cards for alphabetizing
        (3) Imaginary trip cards for direction following

II. Mechanics of Reading Braille

A. Kindergarten and Primary Grades

1. Techniques for beginning reading

a. Posture - back straight, feet on floor, upper arms and elbows at sides, outstretched lower arms and hands to reach page, minimal pressure on elbows to reduce loss of hand and directional control.
b. Use cushion of fingers back of tips; fingertips have less sensation and may become cut or calloused.
c. Reading fingers should be at an acute angle to page, not perpendicular. Book edge should be parallel to desk.
d. Upward and downward motion should be minimized to stress whole character instead of dot-components.
e. A light touch, with hands and fingers relaxed, is used to increase tactual discrimination and to avoid flattening dots. Watch for whitening fingertips.
f. Stress relaxation of body muscles; excessive tenseness causes eventual dulling of perception and decreasing accuracy of muscle movement in upper arms, shoulders, stomach and back.
g. Practice finding top of braille book, reading title page, differentiating page numbers in braille and print editions, using table of contents to locate stories, finding first line on a page, and re-locating stopping place.

(1) Use of metal plate and magnet for math books.
(2) Use of paper clip for prose books.

h. Guide child's hands when necessary to find words, phrases, sentences or math examples.

i. Encourage ultimate two - handed reading

(1) Initially, left hand slides to beginning of next line.
(2) Best readers scan ahead with left hand while completing preceding line with right.
(3) This "skimming" greatly increases speed by enlarging field of reading.
(4) Ability to read with two hands demands maturity. In beginning stages, information concurrently received causes confusion; use of two hands is beneficial as character recognition skill develops.

2. Standard English Braille Code

   a. Dots and symbols should be of normal size from the beginning.
   b. The first letters introduced should be those with the most identifiable shapes in braille - a,b,c, g, l. ⠲ ⠒ ⠢ ⠔ ⠆
   c. Symbols should be presented and felt as whole shapes, not described as groups of specifically numbered dots.
   d. The order of letter introduction will vary to meet the child's ability, and the vocabulary requirements of the primer being used.
   e. When possible, delay introduction of the reverse form of a symbol. Ex. Confusion between f and d, h and j, m and sh often causes later reversal errors in reading.

3. Use of Standard English Braille Code, Grade II

   a. Contractions within a word are introduced as each word is learned.
   b. Introduce frequently used symbols before less commonly used letters. Ex. "for", "the" and "and" precede q and z.
   c. Children eager to learn to read their own names or other specific words may learn a letter or contraction before it occurs in reading.
   d. Whole word signs, dots 5, 4-5, and 4-5-6 contractions, lower signs and short-form words should be learned as they appear in reading.
   e. Early introduction of those contractions which represent phonic units help in word recognition and attack skills.
   f. Child must be made aware of difference between phonetic and structural analyses of braille words.
   g. Actual spelling of short-form or contracted word should be mentioned at time braille form is learned.
   h. Contractions which stand for single words, but which are used as prefixes in braille, such as "to", "into", and "by" demand good positional discrimination.
   i. Ability to read punctuation also demands fine discrimination and a knowledge of placement in relation to a word. Ex. a dropped "d" after a word is a period; a dropped "a" at the end of a word is a comma.

1. By grade four, the average reader should know all contractions used in the Grade II Braille code. Use manuals to teach those not yet encountered in reading.
2. Continue pointing out applications of rules governing use of braille contractions in books and texts.
3. Continuously reinforce all basic skills of reading.
4. Help to develop a desire for recreational reading by providing high interest material on an ability level that will be challenging but not frustrating.
5. Stress importance of reading for main idea, of pausing to mentally review material just read, of mental outlining, and of brief braille notetaking for later study and review.
6. Be alert to correct habits which will reduce speed or accuracy.

C. Braille Reading in Junior and Senior High School

1. Continue to establish the child's needs and to secure texts, workbooks, manuals, reference works, examinations, standardized tests, maps, mimeographed material, special equipment for math, science, shop and home economics, and recreational reading for the student.
2. Introduce the braille equivalents of scientific and mathematical symbols as needed (See Section on teaching the Nemeth Code).
3. Continue to help the student develop good study habits, judicious note-taking skills and good listening skills.
4. Engage the cooperation of subject teachers in verbalizing material written on blackboards, presented on overhead projectors, or shown on film strips.
5. Stress the importance of neatness and careful organization of books and materials to enable the blind student to be prepared for class despite a traveling schedule. Looseleaf books and briefcases are desirable as is a centrally located resource room with open-shelf storage for multi-volumed braille books.
6. Secure or devise supplementary means or materials to teach difficult "visual" concepts, especially those encountered in mathematics classes and science laboratories.
7. Teach the appropriate foreign language code as it is needed.
8. Develop use of braille for convenience and in outside interest areas, and help student to follow through with these programs.

    a. Braille personal address and telephone book.
    b. Use of various types of telephone dials; securing operator assistance.

c. Religious material
d. Braille labels for record collection.
e. Braille tags for color-coding clothing.
f. Use of braille checking account.
g. Braille recipe books and kitchen measuring devices.
h. Cumulative folder of outside reading: title, author, characters and plot summary.
i, Knitting, crocheting and hobby instructions in braille.
j. Braille recreational materials: playing cards, Scrabble, Bingo, crossword puzzles.
k. Pen pals: learning communication through letter writing.
l. Weekly braille newspaper and magazine subscriptions.
m. Braille music code from Library of Congress.
n. Ham radio course available from Hadley School for the Blind.

III. Problems Inherent in the Use of Braille

A. General Problems

1. Because of unique features of the braille code, the process of learning to read is not identical to that for the sighted child.
2. Braille reading, at its fastest, is much slower than print reading because of the limitations in tactual span, the logistics of using unwieldy volumes, and the difficulties involved in scanning.
3. Only a fraction of the books in print have been rendered into braille, because of the time and expence involved. This limits the quantity and variety available to any blind student at any stage in his development. (More and more books are being tape recorded in recent years.)
4. Braille books, of necessity, are bulky, composed of loose pages joined with plastic bindings which must be handled carefully. One print book ususlly produces several braille volumes.
5. Blind students usually require greater classroom work space, because of book size and writing equipment. In addition, the braille books for each student require many shelves for storage.
6. Locating the desired page within a multi-volumed braille book is awkward and time consuming.
7. Glossaries and indexes are usually contained in one or more separate braille volumes, inconvenient for frequent reference.
8. Locating a word in a dictionary of many volumes is a time consuming, frustrating task.
9. Books that have been already brailled must be ordered from central libraries, often resulting in a two or three-week time lag if their need was not anticipated.

10. Books that are brailled specifically for a student require several months to transcribe.
11. The print books must be pre-edited by the itinerant teacher so that the braille equivalent will be meaningful to the blind student. Pictures, diagrams, tables, etc. must be described.

B. Specific Problems

1. The duality of symbolism for some braille words and contractions, depending on position on the line or in the sentence.
2. The multiple use of each symbol, to enable the 63 possible combinations of dots to encompass all printed material: letters, syllables, words, punctuation, numbers, math and science symbols, musical notation, etc.
   Ex: The symbol for the letter (c) . can have at least 10 additional meanings, determined by its position, or by what precedes or follows it.
3. The child must learn further signs which indicate changes in the type composition.
4. Knowledge of the syllabification of a word is essential as a word cannot be compressed or fit in when using braille.
5. Rules which negate use of some contractions before a hyphen or at the beginning of a line or sentence must be learned.
6. Reading errors relating to faulty perception or orientation are more apt to occur in braille because of the minute differences between one symbol and another.

   a. Perception errors - missed dot, added dot or word ending errors.
   b. Orientation errors - reversals, vertical alignment, loss of place on page.
   c. Contraction errors - forgetting one of the almost 200 signs used in Grade II Code.
   d. Meaning errors - gross substitution

7. The teacher must try to prevent or correct 'blindisms' - habits developed by blind children, often engaged in while reading. They include rocking to and fro, side to side head movements, eye-poking, mouthing objects or surfaces.

Section Three: Braille Writing.

I. Basic Aims:

A. To teach the child to write in braille with proficiency and speed.

B. To enable the child to perform basically the same written tasks as his sighted classmates.

C. To help the child attain the coordination, muscle control, mental maturity and self-motivation needed for acquiring this skill.

D. To stimulate awareness of the importance of accurate braille and thorough lesson preparation by being consistent and by insisting that the child be so.

E. To constantly evaluate and to provide remedial exercises when needed.

F. To develop good brailling habits - touch, rhythm, spacing, syllabification of words, use of contractions, adherence to special rules.

G. To instill the necessity of daily practice in order to maintain the facility gained and consistently improve it.

H. To use variety in planning lessons so that braille writing will be an enjoyable activity.

II. Beginning Braille Writing

A. Use of a braille machine (Perkins, Hall or Lavendar)

1. Requires less fine muscle control than use of slate and stylus and is therefore more appropriate for the young child.
2. Braille machines write in a left-to-right direction; the young child is therefore better able to integrate writing and reading activities without developing reversal error problems.
3. Braille machines, unlike the slate and stylus, enable the child to check the written material as it is produced, thus encouraging accuracy.

B. Introduction of the Braille Writer

1. Show parts and explain their functions (Perkins)

a. Six dot-producing keys
b. Central space key
c. Down-space key on left
d. Back-space key on right
e. Carriage lever
f. Paper support bar and roller
g. Paper feed knob
h. Paper release lever

i. Margin stops and their setting; bell
j. Embossing head
k. Paper bottom stop

2. Establish comfortable posture

a. Sit erect with feet on floor
b. Have desk adjusted to comfortable height
c. Hold elbows close to sides

3. Begin to write

a. Learn proper finger position on keys
b. Operate spacer with thumb
c. Left hand shifts paper
d. Right hand back spaces and moves carriage
e. Practice with full cells
   Left hand-index finger-key 1
   middle finger-key 2
   ring finger-key 3
   Right hand-index finger-key 4
   middle finger-key 5
   ring finger-key 6
f. Give each key a simultaneous uniform sharp blow with assigned finger
g. Develop good rhythm
h. Practice with each finger alone
i. Practice on 1-3, 2-4, and different combinations to to strengthen fingers and learn coordinate use.
j. Braille only with supervision during early stages to prevent development of incorrect fingering or bad habits.

C. Teaching letters and words

1. Introduce letters as they are presented to sighted children.
2. Teach name writing, using capital indicator.
3. Write words as they are learned in class, using contractions
4. Teach punctuation when sentence writing begins.
5. Help child make braille labels to paste on items in classroom.
6. Have all braille written double-spaced.
7. Use uncontracted braille for words in spelling lessons.
8. Begin habit of checking written material
   a. this helps with reading
   b. It develops accuracy
   c. It shows spacing errors.
9. Use remedial practice to eliminate common errors.
10. Transcribe all brailled material into written form for use by classroom teacher in evaluating child's progress.

D. Evaluation of Braille Writing Skills - by intermediate grade child should be able to write all the symbols encountered in written braille. Fill in any gaps until he is able to reproduce all the following in braille as well as to know the rules applying to their use:

1. Alphabet
2. Whole word contractions
   a. whole word contractions, plus dot 5
3. Part word contractions
   a. dot 5 plus part word contractions
4. Numerals
5. gh, ed, er, ar, used as part word contractions
6. Single cell whole and part words
   a. and, of, for, with, in
   b. sh- shall, th- this, ch, wh, ou, st
7. Punctuation - be, were, his was (words that stand alone)
8. Whole-word Lower sign contractions for his, was, were, be, in and by: Part- word Lower sign Contractions for in, en, be, con, dis and com.
9. Letters appearing between other letters and contractions and also for syllable of word- bem, con, dis
10. Contractions not used at beginning of word - ing, ble
11. Word signs used close to word or letter that follows (to, into, by)
12. Initial contractions dot 4,5 and 4,5,6
13. Final contractions dot 4,6 and 5,6 and 6.
14. Part word only- not at beginning of word (ance, ence, etc.)
15. Final contractions- must never stand alone and never begin a word
16. lower signs used at beginning, medial and final position of words
    beginning- to into and by
    medial- bb, cc, dd, ff, gg, ea
    final- punctuation
17. Short form words abv- above, tn- tonight
    a. abbreviated words weights and measures etc.
18. Special signs
    a. letter signs, stammering, spelling etc.
19. Roman Numerals, Decimals, Fractions used of numbers

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Dorf, Maxine and Scharry, Earl "Instruction Manual For Braille Transcribing" Third Edition; Division for the Blind Library of Gongress, Washington: 1962

III. Use of the Slate and Stylus for Braille Writing

A. Basic aims

1. To teach the child a means of writing with a pocket-sized device.
2. To learn proper and adequate use of the slate method.
3. To produce neat, readable braille
4. To build up adequate speed for note-taking
5. To develop confident proficiency with the braille slate

B. Introduction of the Slate - timed to coincide with the development in the child of adequate manual dexterity and mental maturity to meet the requirements of the instrument.

1. Have child handle slate and stylus
2. Explain that dots are pushed into paper from right to left, with dots 1,2,3 on the right, and 4,5,6 on the left of each cell.
3. Count number of cells available on each line; stress need to watch for line end and to hyphenate word if necessary.
4. Practice getting paper into clip and hinge
5. Learn to move slate down a notch after every fourth line, using two hands and sliding motion.

C. Writing with the Slate and Stylus

1. Practice locating each of six grooves or notches within a cell with the stylus.
2. Push firmly gripped stylus straight down with strong pressure to form clear dot in each notch.
3. Practice first ten letters of alphabet, which use only dots 1-2-4-5.
4. Practice next ten, which add dot 3 to the above ten.
5. Practice remainder of alphabet, which adds dot 6.
6. Revert to calling out numbered dot configuration of problem letters, while practicing, if reversal problems occur.
7. Use left hand to help guide stylus to proper position.

IV. Standard English Braille, Grade III

A. Is a highly-compressed, much contracted form of braille for personal use.

B. For use by very strongly motivated and academically talented students.

C. Should be introduced in late high school by securing home-study course from Hadley School for the Blind.

D. Once mastered, it gives the student added speed and an economy of space in note-taking.

Section Four: Teaching Signature Writing

I. Rationale

A. Learning to sign one's name is essential; it is degrading to have to depend on another person to sign your name.

B. It is not necessary for the blind person to be proficient in handwriting as typewriting is a most acceptable form of written communication. However, mastery of the signature is essential.

II. Initial Preparation

A. Introduce blind child to three-dimensional capital block letters when sighted children are beginning to learn alphabet.

B. Encourage child to at least be able to identify the letters used in his own name.

C. Have child practice drawing letters on a screen board with a wax crayon.

D. If the child shows desire to write his name, he can be taught in lower grades; otherwise defer until later.

III. Motivation - point out importance of signature writing often.

A. Signing contracts

B. College applications

C. Job applications

D. Letter writing

E. Writing checks

F. Order blanks

G. Draft and voting registration

IV. Mechanics of signature writing

A. Development of two-dimensional spatial concepts - up and down, left to right, diagonals.

B. Develop muscular coordination by having student trace gross circles and loops, and vertical zigzags, using full hand in air, then with finger on desk and with chalk on blackboard.

C. Confer with student on how he wishes final signature to appear. It may be practical to limit first name to initial.

D. Reproduce student's signature for tactile examination. (Outlining with Elmer's glue; string pasted on cardboard; engraving in masonite. Touch-Aids individually engraved signatures. Raised-line drawing kit.)

E. Determine handedness and show student how to hold pencil. Thumb and index finger should be no more than ½" from the tip, second finger is set opposite the thumb, third and fourth finger are bent in toward palm.

F. Position paper on a slant so that forearm rests comfortably on table.

G. Teach one letter at a time, starting with a relatively simple letter from which the construction of the others can be developed.

H. For each letter in signature:

1. Explain formation verbally.
2. Show each embossed letter singly.
3. Show embossed letter as it appears in student's name.
4. Have student practice tracing letter in engraved letter board.
5. Have student practice letter on raised line paper.
6. Guide student's hand initially to show correct progression of motion.

I. Continue with each letter until kinesthetic memory has been developed.

J. Introduce joining of letters and proper spacing at this time.

V. Purposeful practice

A. The skill must be practiced, once mastered, as frequently as possible lest it be lost through disuse.

B. Student should be urged to sign all papers and letters; teachers can insist that all classwork and homework be signed by student.

C. Insist that adventitiously blinded students continue to do some school work in manuscript on a regular basis to maintain this valuable skill.

VI. Instructional Materials

A. For spatial orientation

1. Raised line writing paper
2. Raised-line Drawing Kit
3. Signature guide
4. Check writing guide
5. Templet - Letteriter for the Blind

B. For Mental orientation

1. Screenboard and wax pencil
2. Embossed signature
3. Embossed alphabet chart
4. Three-dimensional letters
5. Raised line drawing kit

C. For kinesthetic training

1. Engraved letter board and pencil shaped stylus.
2. A.P.H. kit
3. Touch-Aids individually engraved signatures.

Section Five: Teaching the Nemeth Code of Braille Mathematics and Scientific Notation and the Use of Mathematics Aids.

I. Basic Aims

A. To teach the child to read, write and perform accurate computations at all levels of mathematics.

B. To enable the student to keep on with his sighted classmates.

C. To introduce various techniques and methods of computation, and to determine which is best for each child's use.

D. To help the child form abstract mathematical concepts usually derived through use of vision.

E. To form positive attitudes toward mathematics by making it meaningful and relevant to the child's daily life.

F. To encourage the classroom teacher's verbalization of blackboard work and other visual teaching techniques.

II. Reading and Writing the Nemeth Code; Use of Supplementary Aids.

A. Kindergarten, Primary and Intermediate Grades

1. Introduce use of the numeric indicator and dropped number symbols.
2. Explain common signs of operation as they are encountered in workbooks.
3. Use braille writer for calculations as it allows simultaneous reading.
4. Show linear method of computation as well as vertical alignment; encourage mental calculations when possible.
5. Introduce Taylor and cubarithm slate and cubes when child is ready.
6. Teach the Japanese abacus for addition, subtraction, multiplication and division; stress daily practice.
7. Begin reading and constructing of simple graphs and charts as called for by grade curriculum.
8. Insist on perfect mastery of basic number facts in all operations; use flash cards and verbal drill.

B. Junior and Senior High School

1. Continue to teach special symbols of the Nemeth Code as they occur in text books.
2. Stress accuracy, neatness and consistency.
3. Occasionally request modification of quantity if blind student is spending two or three times as long to complete assignments as his classmates.
4. Render into Nemeth Code supplementary mimeographed worksheets used by class.
5. Braille class examinations so that blind student's skills may be evaluated with those of his classmates; transcribe answer papers into print for classroom teacher.
6. Continue to introduce supplementary aids and devices to insure concept formation through tactile means.
7. Request and verify that braille versions of standardized tests, New York State Regents examinations, College Entrance Exam Boards, New York State Regents Scholarship examinations and National Merit Scholarship Exams are ordered in the appropriate revision of Nemeth Code (usually 1965).
8. Order the four volume braille version of the Nemeth Code for the Students use: guide use of its index.

III. Supplementary Mathematics and Science Aids and Devices

A. Primary and Intermediate Grades

1. Flash cards for number facts
2. Braille number line
3. Large abacus for concept of tens and hundreds
4. Taylor slate and arithmetic type
5. Brannan cubarithm slate
6. Metal sheet and magnet for place keeping in book
7. Braille ruler and modified tape measure
8. Cut-out boards with geometric shapes
9. Braille clock
10. Braille thermometer
11. Cuisanaire rods
12. Master cube
13. Japanese abacus for calculations
14. Iowa book maps
15. Mitchell Wire Forms with matched planes and volumes

B. Junior and Senior High School

1. Sewell Raised-Lined Drawing Kit
2. Graphic aids for Math
3. Swail Dot inverter
4. Braille protractor
5. Compasses, tracing wheels
6. Calculaid
7. Burns Teacher's Board
8. Dymo braille typewriter for labelling
9. Taylor slate with algebra type
10. Graph board and pegs
11. Braille graph paper
12. Circular braille slide rule
13. Origami paper for geometry techniques
14. Three dimensional geometric solids
15. Manuals of Science diagrams
16. Bio-tac kit of biology diagrams

IV. Special Problems of Braille Mathematics

A. The student can never see an arithmetic example as a whole; memory must be utilized while components are integrated.

B. Since arithmetical computations follow other than a left to right sequence, directional orientation problems and "searching" often result.

C. Multiple use of the 63 braille characters available necessitates use of various extra symbols: numeric and

Punctuation indicators, fraction, subscript and superscript indicators, etc. In addition, many simple mathematical signs require two or three cells in braille. Ex. Writing ½ in Nemeth Code consumes 5 cells, or 6 if the fraction line is diagonal.

D. There are approximately 425 Nemeth Code symbols, many composed of 2 to 7 characters, used through high school mathematics.

E. Writing arithmetic examples on a braille writer is an often tedious process, involving much hand motion from keys to paper and back, and continuous backspacing and downspacing for proper placement.

F. Other computational devices often have drawbacks; the Taylor and cubarithm slates use many small pieces; jostling the board can result in disarray and error.

G. Since both Braille reading and writing are slow processes, mathematics is often frustrating for the blind child. Good concept formation, verbalized mental calculations guided by the special teacher, and use of the abacus when possible, can provide necessary practice without boredom and negativeness.

H. Building as it does on prior concepts, mathematics instruction must be highly individualized for blind children.

Section Six: Teaching Braille to the Adventitiously Blinded Child

I. Basic Aims

A. To give the recently blinded school age child a means through which he can continue his education.

B. To help the child accept braille as a necessary method of written communication.

C. To maintain the student's skills at his appropriate grade level through verbal means during the transitional stage from print to braille.

D. To give the child support and encouragement as he adjusts to and accepts his handicap and learns to be productive despite his new limitation.

II. Modifications of Approach

A. Intensive counselling, in order to insure positive

acceptance of braille and strong self-motivation, is a necessary prerequisite.

B. The regular readiness program is applied, but because of the child's more advanced coordination, better spatial orientation, retained visual imagery, and finer muscle control, it should be completed over a much shorter period of time.

C. If the child has already learned to read, the Standard English Braille Code; Grade II can be taught as it would be to a sighted person, through memorization of the dot structure of various characters and contractions, and of the rules governing their use.

D. Simultaneously develop tactile discrimination and begin with simple reading materials containing already learned contractions. The Krebs Manuals are of great value here.

E. Integrate writing and reading, as one reinforces the learnings of the other.

F. Follow all techniques used with congenitally blind children, modifying to utilize visual remembrances.

G. Insist student maintain his handwriting skills using wire handwriting guide or raised line paper.

H. Provide grade level braille reading materials as soon as child can cope with them.

I. Build listening skills for use of taped books while braille proficiency is developing.

J. Insist on intensive practice of both reading and writing until a reasonable speed is attained.

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